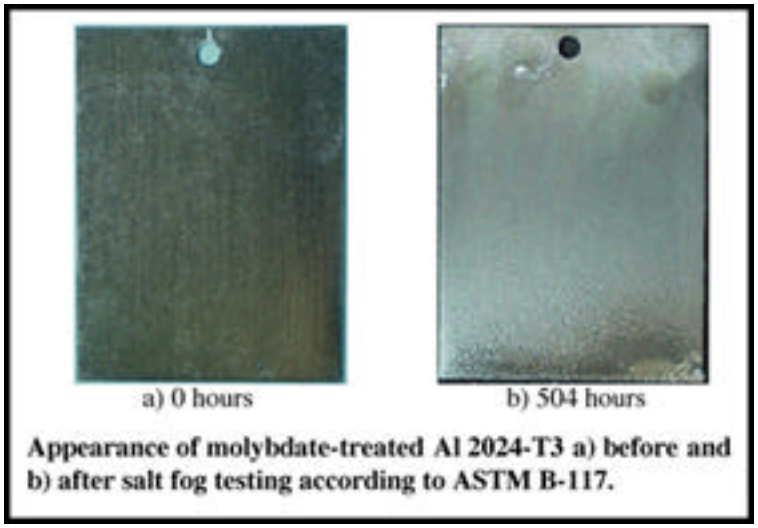
NASA Success Story

Molybdate Conversion Coatings for Aluminum and Alloys



Appearance of molybdate-treated Al 2024-T3 a) before and b) after salt fog testing according to ASTM B-117.

The development of an environmentally friendly aluminum coating for government and industrial applications has resulted from a collaboration involving Lynntech, Inc. of Texas and NASA at Kennedy Space Center (KSC). Lynntech, of College Station, participated with the KSC Materials Science Division (MSD) under a Small Business Innovation Research (SBIR) contract to develop a molybdate-based conversion coating for aluminum and aluminum alloys. This innovation, referred to as Molyseal, is important because it does not contain chemicals or materials that are hazardous, toxic, or give rise to health and safety concerns. Lynntech has applied for several patents relating to this technology and has formed an alliance with multiple industrial partners in the metal finishing industry. Since Lynntech is a technology innovation and development company, its goal is to move this innovation to the pre-commercial stage and secure appropriate patents rights, and then to license the technology to an interested manufacturer for entry into the commercial sector. The commercialization strategy includes third-party validation of the technology provided by leading end-users of chromium conversion processes through in-kind testing. Molyseal can be applied by dipping, painting, or spraying, with short treatment times at low temperatures, and is compatible with existing cleaning and pretreatment procedures. Only commercially available chemicals and materials are used, which do not require special storage provisions, and can be easily adapted into existing application methods. Lynntech envisions government and science applications in the U.S. military arsenal of missiles, NASA spacecraft, and Department of Defense prime contractors. Industrial applications include aerospace, boilers, air conditioners and aluminum construction materials.

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NASA Success Story

Molybdate Conversion Coatings for Aluminum and Alloys (Continued)

NASA Involvement NASA at KSC has used chromate-based coatings on many of its spacecraft and desires to replace these harmful chemicals with safer coatings. Until the successful formulation of Molyseal, NASA had no other alternatives. The KSC MSD envisions future NASA use of this coating on Space Shuttle ground support equipment at the launch pad, the Space Shuttle Orbiter, the solid rocket boosters (SRBs), and other NASA spacecraft and aircraft.

Social/Economic Benefit Use of chemical conversion coatings on aluminum alloys to achieve long-term corrosion resistance of painted spacecraft and aircraft structures have found widespread military and commercial applications. With increasing environmental regulations, the use of chemical conversion coatings that do not contain harmful chemicals is of particular interest to NASA, the Department of Defense, and other Federal agencies. The use of chromate-based conversion coatings generate health and safety concerns due to their toxicity and carcinogenic nature. Chromates have been found to cause irritation of the respiratory tract, produce ulcerations and perforations of the nasal septum, cause dermatitis, skin sensitization, asthma, and produce lung cancer. Alternatives for chromate conversion coatings that exhibit the same corrosion resistance and that are formulated from environmentally acceptable chemicals are greatly needed. Lynntech has developed and tested a new type of molybdate-based conversion coating that provides both features. Tests demonstrate an exceptional corrosion resistance of the new coating prepared from formulations consisting of molybdates and several important additives. Some Molyseal coatings outperformed the chromate-based conversion coatings in electrochemical corrosion resistance tests and passed a standard 336-hour salt fog test. These results established a sound technical feasibility for this new molybdate conversion coating.

Industry Partner
Lynntech, Inc.

NASA Partner
Kennedy Space Center

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